

REMARKS

Reconsideration of this application is requested.

The claims pending for consideration are claims 1-11, 15, 16, 18 and 24 to 29. Claim 30 is being canceled herewith without prejudice to the substance thereof. Claims 12-14, 17 and 19-23 were previously canceled.

Applicants' independent claims 1, 25, 26 and 27 have been amended by replacing the language "which is substantially free from organic solvent" with "G) not greater than 2 parts of organic solvent". It is believed that this change improves the form of the claims. Basis for the indicated amendment of the claims is found at page 3, lines 20-26 of the applicants' specification.

Claims 6-11 have been amended by changing "adhesion promoter" to "metal adhesion promoting organic compound". The basis for this language is found at page 4, line 39 to page 5, line 3 and claim 1 as filed. This amendment is thought to improve the clarity and antecedence of the sub claims versus claim 1.

It is noted that the Examiner has listed claims 9, 10, 24 and 26 as "objected to". However, no specific objection seems to have been indicated. Clarification from the Examiner is requested.

The Examiner has rejected the applicants' claims on the following grounds:

- (1) claims 1, 2, 4-8, 11, 15, 18, 24-26, 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lent et al. (U.S. 5,270,368), further in view of Setthachayanon (U.S. 5,089,376);
- (2) claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lent et al. and Setthachayanon as applied to claim 1, further in view of Sasaki et al. (U.S. 4,789,620);
- (3) claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lent et al. and Setthachayanon, further in view of Sato et al. (U.S. 4,839,400); and
- (4) claims 16, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lent et al. and Setthachayanon, as applied to claim 1, further in view of Motoshima et al. (U.S. 5,677,398).

The applicants respectfully submit that the references relied on by the Examiner do not make the presently claimed invention obvious. The applicants' position is detailed below. However, at the outset, it is noted that the Examiner's primary references (Lent et al., hereinafter "Lent") and Setthachayanon (hereinafter '376) have substantive deficiencies as far as the applicants' invention is concerned. For example, neither Lent nor the '376 patent teach

inks which comprise not greater than 2 parts of organic solvent. Lent requires organic solvent and '376 teaches a preference for solvents for low viscosity application methods.

Other essential points are also worth noting. For example, Lent does not teach or suggest solder mask inks but instead clearly teaches etch-resist inks. These are just not the same and the Examiner's assertion that "however it is obvious that the mask is capable to be employed as a "solder mask" is unsustainable when one properly understands the different demands and properties of solder masks and etch-resist. Furthermore, Lent et al. and the '376 patent relate to very different application methods. Thus Lent's ink jet printing is not at all the same as '376's screen printing or spraying.

Thus, in short, neither Lent nor '376 is suggestive of the applicants' invention. There is no valid basis for considering the references together because their respective differences are such that one in the art would not consider the two disclosures together. However, even if the references are considered together, the applicants' invention is not obtained because neither reference teaches inks which include no greater than 2 parts organic solvent. Manifestly, to support a Section 103(a) rejection, the art must show all of the claimed features. This is not the case here.

Turning more specifically to the Examiner's rejections, it is noted that these are based on the assumption that Lent teaches inks which are free or substantially free of organic solvent. However, it is respectfully submitted that this is not at all the case. In this regard, the Examiner's attention is drawn to Lent claim 1, component c); Abstract; Column 3, lines 48 and 65; Column 6, lines 13 to 28; Column 7, lines 53 to 61; Example 1, Column 8, line 47 to 48 which contains 53% methanol and 2.5% methyl ethyl ketone.

It is thus clear that, contrary to the Examiner's comments, Lent teaches that organic solvent must be present in the inks and preferably in an amount from 30 to 60% (Column 6, lines 25 to 28).

In contrast, the applicants' claims, as previously presented, specified that the solder mask ink be substantially free from organic solvent and, as the presently amended claims specify, the applicants' ink comprises no greater than 2 parts of organic solvent. This is a fundamental departure from anything disclosed or suggested by Lent, particularly since the reference teaches that organic solvent is essential. Thus, even if there was secondary art teaching that no organic solvent should be used, combining such disclosure with Lent would be inappropriate since organic solvent is taught to be essential to Lent. Clearly features

considered essential to an invention cannot be disregarded to create a reference combination which artificially meets claim language. However, in the present case, even this situation does not exist because the '376 patent makes it clear that for low viscosity embodiments (about 50 to 1000 cPs), solvent should be added (Column 11, lines 52 to 58). See also the working examples 'of the '376 patent, e.g. Column 15, Example 6, Table 3 which contains 41.8 parts of N-methyl pyrrolidone or equally Column 16, Example 7, Table 4 which contains 131 parts of PMA also an organic solvent.

Thus, even if the person of ordinary skill were to combine Lent et al. and the '376 patent, this combination consistently teaches away from an essential requirement of the applicants' ink.

The applicants respectfully submit that for the reasons noted above, the Examiner's rejection (1) above, based on Lent and the '376 patent, should be withdrawn and the applicants' claims found allowable thereover.

However, there are even more reasons why Lent and the '376 patent are not suggestive of the applicants' claims. Thus, for example, Lent does not mention solder masks. Lent relates to etch-resists (Abstract; Column 1, line 5 and line 45; Column 3, lines 22, 34, 59; Column 4, line 13). The Examiner asserts that it is obvious that an etch-resist could be employed as a solder mask. On the contrary, however, the person of ordinary skill would not think this as the two are very different.

Etching, e.g. etching of copper, is typically performed by exposing a copper laminated dielectric board to an aqueous bath containing a chemical etchant such as copper (II) chloride, ammoniacal copper (II) or ferric chloride. Etching may be performed at room temperature or up to 60°C.

In contrast, soldering is performed using molten solder typically at high temperatures of around 260°C or higher. See page 10, line 40 of the present patent application. Solder masks also require high hardness, good electrical and solvent resistance (flux). See page 11, lines 1 to 7 of the present application.

An etch resist ink is generally removed from the final electronic device (e.g. PCB) while a solder mask is generally retained. Thus, an etch resist cannot have adhesion which is too good while a solder resist should have excellent and long lived adhesion.

Clearly, the person of ordinary skill in the art would recognize that something mentioned as an etch-resist ink provides no presumption of use as a solder mask ink. In fact, reference to

an etch-resist ink points to a very different ink from a solder mask ink with very different properties.

The applicants also note that Lent relates to low viscosity inks (Column 8, lines 7 to 16), e.g. 1 to 10 cPs applied by means of an ink jet printer. The '376 patent, on the other hand, relates to UV sensitive urethane resins which easily result in very viscous thixotropic screen printing inks of viscosity 55,000 to 65,000 cPs or to spray coating inks from about 50 to 1000 cPs. The suggestion in the '376 patent is that these urethane resins tend to be suited to inks and application methods involving high viscosities. Thus, the person of ordinary skill would not think that these urethane resins would be suitable in an ink jet printing ink having low viscosities.

Finally, it is noted that the applicants, after diligent research and much inventive effort, have found inks and a solder mask process which afford highly desirable pencil hardness, copper adhesion and solder bath resistance (see applicants' disclosure at pages 29 to 31, Table 2 which covers over 70 embodiments of the present invention). All of this is achieved using inks containing not greater than 2 parts of organic solvent. None of this is afore-shadowed or suggested by the cited art.

For all of the reasons noted, the applicants respectfully submit that the Examiner's rejection of claims 1-2, 4-8, 11, 15, 18, 24-26, 28 and 30, drawn to a non-aqueous solder mask ink and process of using same, define subject matter which is new and unobvious from Lent and the '376 patent even if these disclosures are considered together when there really is no valid basis for doing so. Accordingly, it is urged that the Examiner's rejection should be withdrawn and the indicated claims allowed.

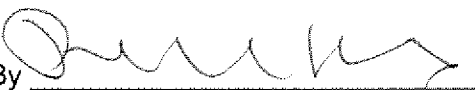
For similar reasons, the Examiner's rejections of claims 3, 9-10, 16, 27 and 29 as set out under rejections (2)-(4) above should be withdrawn. The supplemental references relied on by the Examiner do not fill in the substantive deficiencies noted above with regard to Lent and the '376 disclosure.

The Examiner's attention is called to the supplemental IDS with PTO-1449 which is being filed herewith. The references noted are not considered suggestive of the applicants' invention. However, the Examiner is requested to consider the additional art in the examination of the application.

Consistent with the above, favorable reconsideration with allowance is requested.

Respectfully submitted,

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